Appendix A

Fishing Effort in the Pacific Ocean

Despite the ban on high-seas driftnet fishing in the north Pacific Ocean in the early 1990s, fishing effort by longliners, purse seiners, trollers, and coastal driftnetters continues throughout the Pacific Ocean. The number of vessels per country varies greatly, from less than 10 for some of the small island nations (e.g. Papua New Guinea, Tonga, and Vanuatu), to over 600 for the more economically powerful countries, such as Japan. For most of these fishing fleets, little or no data exists regarding the incidental bycatch of marine mammal and sea turtle populations, particularly for those species in danger of extinction. Without such information, it is difficult to assess the impacts of these fisheries on species included in this Opinion. Nevertheless, bycatch information, including survival rates following entanglements, collected by observers and through fisher self reporting does exist for some fisheries in the eastern and western Pacific Ocean. Given such data, coupled with distribution and abundance records for the various species, one can at least gain a sense of the possible impacts of those fisheries for which no information exists. The following sections summarize past and current fishing effort in the eastern and central western Pacific Ocean.

A. Fishing effort in the Central Western Pacific Ocean

Although high-seas driftnet vessels no longer operate in the North Pacific, longliners, purse seiners, trollers, and pole-and-liners continue to fish, mainly for tuna species, in the Central Western Pacific Ocean, typically west of the 150EW longitude and north and south of the equator.

Table 1 provides a summary of the known number of active longline vessels, by country, by year, from 1990-1999 in the Central Western Pacific Ocean. Preliminary estimates are represented in parenthesis ( ) and are only based on data from the last known year. Where known, the number of total hooks deployed during a particular year was included (e.g. Korea and Taiwan-distant water). Okamoto *et al*. (1999) estimated the number of hooks deployed by Japan's offshore and distant water longline fleet in the Western Pacific Ocean: 1990 - 192,000,000 hooks; 1991 - 170,000,000 hooks; 1992 - 154,000,000 hooks; 1993 - 164,000,000 hooks, 1994 - 158,000,000 hooks; 1995 - 141,000,000 hooks; 1996 - 127,000,000 hooks; and 1997 - 131,000,000 hooks. While many of the small Pacific island countries have relatively small longline fleets, Japan and Taiwan clearly dominate this fishery, fishing coastally, in distant water, and offshore. The number of Japanese coastal and distant water tuna longliners has remained relatively constant from 1990-99 (averaging 740 and 660 vessels, respectively, per year), while the number of its active offshore tuna longliners in 1997-99 have declined by nearly one half (from approximately 360 vessels to 180 vessels) since 1990[1]. Taiwan's offshore fleet is

[1]In reference to the Japanese tuna longline fleet, "offshore" refers to vessels that fish outside Japan's EEZ but closer to Japan, while "distant water" refers to vessels which fish in other areas throughout the Pacific Ocean (A. Coan, NMFS, personal communication, August, 2000).

particularly large, composed of an average of 1,500 active vessels per year (based on data from 1990-99), while the number of vessels included in its distant water fleet ranged from 52 to 88 vessels over the past ten years. The number of vessels included in Korea's longline fleet has remained relatively constant from 1990-99, averaging 168 active vessels per year. The number of active longliners in other countries over the past 10 years appears relatively steady, with American Samoa and Vanuatu entering the fishery in 1995, an increase by China in the mid-1990s, and increases since the early and mid-1990s by Australia, Fiji, French Polynesia, Micronesia, New Zealand, and Samoa.

Table 1. Number of active longline vessels fishing, by country, by year, in the Central Western Pacific Ocean

Country/Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
American Samoa	–	–	–	–	–	6	13	22	27	(27)
Australia - domestic	117	111	124	109	110	109	115	137	156	174
Australia-Japan JV	14	29	56	66	52	21	–	–	–	–
China	23	39	72	310	456	422	323	140	116	(116)
Cook Islands	–	–	–	–	2	2	3	–	–	–
Fed States Micronesia	–	2	7	7	9	11	9	15	21	(21)
Fiji	6	9	18	22	37	48	42	34	39	(39)
French Polynesia	2	8	25	50	66	65	58	59	54	57
Indonesia	151	145	141	309	293	(293)	(293)	(293)	(293)	(293)
Japan - coastal	685	768	793	790	819	738	711	698	(698)	(698)
Japan- distant water	791	790	768	767	749	744	703	695	(695)	(695)
Japan - offshore	362	332	302	272	255	222	200	180	(180)	(180)
Kiribati	–	–	–	–	–	1	1	–	–	–
Korea (# vessels and total # hooks)[1]	182	220	166	148	160	154	156	148	169	(169)
	73,216	53,452	62,125	56,190	76,380	81,831	73,420	68,241	66,193	–
Marshall Islands	–	–	2	5	2	4	–	–	–	–
New Caledonia	7	6	4	4	5	8	8	9	11	13
New Zealand	17	21	30	40	56	96	84	56	(56)	(56)
Papua New Guinea	–	–	–	2	4	11	7	8	8	(8)
Philippines	26	12	10	10	10	10	10	(10)	(10)	(10)
Samoa	–	–	–	17	25	45	90	150	150	151
Solomon Islands	–	–	–	–	–	20	36	31	22	14

Taiwan - distant water (# vessels and # hooks)[1]	52	74	88	72	67	62	56	53	64	65
	37,681	58,783	35,089	28,440	41,083	52,615	31,394	–	–	--
Taiwan - offshore Taiwan	1,139	800	1,898	1,791	1,753	1,603	1,274	1,877	1,712	1,696
Taiwan - offshore Micronesia	–	–	–	254	132	92	123	217	208	(208)
Tonga	1	1	1	6	5	7	7	(7)	(7)	(7)
United States	138	143	131	129	141	127	115	110	118	(118)
Vanuatu	–	–	–	–	–	2	3	1	1	(1)
TOTAL	**3,713**	**3,510**	**4,686**	**5,180**	**5,208**	**4,923**	**4,440**	**4,950**	**4,815**	**4,816**

[1]Number of hooks is in thousands (000s)

Source: Southwest Fisheries Science Center (SWFSC) unpublished data from Secretariat of the Pacific Community based in Noumea, New Caledonia.

Table 2 provides a summary of the known number of active purse seine vessels, by country, by year, from 1990-1999 in the Central Western Pacific Ocean.

Table 2. Number of active purse seine vessels fishing, by country, by year, in the Central Western Pacific Ocean

Country/Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Australia - domestic	1	6	13	7	4	2	4	5	4	7
Australia - distant water	8	6	2	1	–	–	–	–	–	–
Fed. States of Micronesia	–	6	7	7	8	6	4	4	3	(3)
Japan - coastal	43	38	31	27	23	20	21	20	(20)	(20)
Japan - offshore and distant water	35	35	38	36	33	31	32	35	35	35
Kiribati	–	–	–	–	1	1	1	1	1	(1)
Korea	39	36	36	34	32	30	28	27	26	26
New Zealand	3	6	7	5	6	6	6	6	6	6
Papua New Guinea	–	–	–	–	2	3	4	10	13	(13)
Philippines - domestic (purse seine & ring)	549	546	407	399	(399)	(399)	(399)	(399)	(399)	(399)

Philippines - distant water	13	15	12	12	11	13	12	12	12	(12)
Russia	5	4	3	8	4	–	–	–	–	–
Solomon Islands	4	3	3	3	3	3	3	4	4	4
Taiwan	32	39	45	43	43	42	42	42	42	42
United States	43	43	44	42	49	44	40	35	39	36
Vanuatu	–	–	–	–	1	2	2	5	5	(5)
Total	**775**	**783**	**648**	**624**	**619**	**603**	**598**	**605**	**609**	**609**

Source: Southwest Fisheries Science Center (SWFSC) unpublished data from Secretariat of the Pacific Community based in Noumea, New Caledonia.

Table 3 provides a summary of the known number of active troll vessels, by country, by year, from 1990-1999 in the Central Western Pacific Ocean.

Table 3. Number of active troll vessels fishing, by country, by year, in the Central Western Pacific Ocean

Country/year	89-90	90-91	91-92	92-93	93-94	94-95	95-96	96-97	97-98	98-99
Canada	–	–	–	–	–	–	–	–	–	2
French Polynesia	3	4	2	4	–	4	4	1	–	–
New Zealand	125	229	247	425	500	478	429	268	268	268
United States	38	58	55	47	14	21	50	28	35	–
Total	**166**	**291**	**304**	**476**	**514**	**503**	**483**	**297**	**303**	**270**

Source: Southwest Fisheries Science Center (SWFSC) unpublished data from Secretariat of the Pacific Community based in Noumea, New Caledonia.

B. Fishing effort in the Eastern Pacific Ocean

Chile

Despite significant reverses since swordfish catch peaked in 1991, Chile continues to conduct the largest gillnet and longline swordfish fishery in Latin America. This fishery is economically significant to both commercial and artisanal fishermen. Since 1980, this fishery grew by nearly an order of magnitude as fishermen developed more efficient methods and foreign demand for swordfish expanded. From 1987 the Chilean swordfish driftnet fishery expanded rapidly with many hundreds of boats concentrated primarily in four ports - Chañaral, Valparaiso, San Antonio, and Concepcion. Most of these vessels were small (14-15 meters) and switched from a harpoon fishery to a driftnet fishery. The artisanal swordfish fleet alone expanded from 4,777 days-at-sea in 1987 to 40,692 days-at-sea in

1993 (Weidner and Serrano, 1997).

Table 4. Chile – Fishing fleet, 1993-96. ( ) indicates # of artisanal swordfish vessels.

Year	Seiners	Trawlers	Long-liners	Driftnets	Traps	Harpoon	Comm. Total	Artisanal	Grand Total
1993	410	72	115	40	2	1	640	8,904 (350)	9,544
1994	383	72	88	32	3	--	578	10,864 (275)	11,442
1995	370	70	74	28	3	--	545	12,045 (286)	12,590
1996	385	73	45*	19	2	--	524	12,619	13,143

*Primarily targeting groundfish
Source: *in* Weidner and Serrano (1997).

Colombia

Colombia's commercial fleet is dominated by the coastal shrimp fleet (nearly half), but there are also a large number of tuna vessels, primarily purse seiners. As shown in the following table, foreign vessels also operate out of Colombia, including Japanese longliners targeting tuna. In 1997, there were eight foreign longliners operating out of Colombia, with over half of Japanese nationality. Most artisanal fishermen out of Colombia operate very close to shore, targeting mainly pelagics. Little is known about the number of artisanal vessels operating off the Pacific coast of Colombia; however, they are known to deploy small longlines, driftnets and purse seines (Weidner and Serrano, 1997).

Table 5. Columbia - commercial fishing fleet 1992-95.

Year	Domestic Vessels	Foreign vessels*	Total
1992	252	215	467
1993	n/a	150	n/a
1994	156	174	330
1995	192	168	360

*Foreign vessels licensed and working in association with Columbia companies.
Source: Weidner and Serrano, 1997.

Ecuador

Ecuadoran commercial fishing operations, consisting mainly of seiners, are conducted nearly entirely within their 200 mile (Exclusive Economic Zone) EEZ; however, sever larger longliners have operated over 1,000 km off the coast, west of the Galapagos Islands. The fleet continues to expand, and it is likely that operations to the west of the Galapagos will increase, given the profitability of swordfish and expanding technical capabilities. The artisanal fisheries of Ecuador are generally limited to inshore coastal waters, although some longline fishermen have begun to fish around the Galapagos. In 1996, the bulk of the Ecuadoran fishing fleet was comprised of artisanal vessels (93%), and although estimates vary, there may have been as many as 6,000-8,000 active fishing vessels in Ecuador (3,971 estimated

vessels in 1996). Foreign longliners have also been operating off Ecuador for many years, and most are from Japan. In 1996, there were an estimated 15-20 foreign longliners, all Japanese, except for one (Weidner and Serrano, 1997).

Peru

Unlike Chile and Ecuador, Peru has not developed a substantial longline or driftnet fleet, and there is little information on the number of vessels, both commercial and artisanal, that are currently operating in various fisheries off Peru. Artisanal longliners generally deploy in shallow water, no deeper than 100 meters, and generally close to shore (normally no more than 50 km from the mainland), while drift gillnetters rarely fish more than 20-30 miles offshore. As of 1997 there were only four domestically built longliners, and fishing generally occurs about 50 km from the coast. Between 1980-97, there were 17 Peruvian-owned commercial lon368gliners. There is limited information on foreign fleet operations off Peru, but vessels, mostly Japanese and Spanish, do fish primarily off the southern coast, both inside and outside the 200 mile limit. Between 1980-97, there were at least 9 foreign leased longliners (Japan) and 11 Spanish longliners (Weidner and Serrano, 1997).

Mexico

In 1983, Mexico established a 50 nautical mile (NM) sportfishing-only zone along its coast to protect billfish, swordfish, tuna, and other popular species and to manage them for the recreation and tourist industries. Commercial fisheries for swordfish outside this exclusion zone included longliners until 1990 and drift gillnetters. Limited longline permits were issued in 1987, allowing only about 15 vessels to fish within Mexico's EEZ. Operating under these permits, the Japanese/Mexico joint venture fleet increased fishing effort to 2.3 million hooks between 1986-88. Due to the reduction in longline permits, a small (2 vessels) drift gillnet fleet appeared in northern Baja California in 1986, growing to 20 by 1990 and to 31 by 1993. Fishing effort increased from 15 days/month in 1989 to 20-30+ days/month in 1993. By 1994, the number of vessels had declined to 16, primarily due to low catch. Most of these vessels are home-based out on Ensenada and are similar in appearance and operation to the California/Oregon drift gillnet fishery, although they use nets up to twice as long as those used on U.S. vessels. The swordfish fishery begins in the fall for the Mexican drift gillnetters, off Ensenada, moving south to central Baja, California (between 25°N and 27°N) during December and January (Holts and Sosa-Nishizaki, 1998).

REFERENCES

Any references used in this Appendix are listed in the Biological Opinion.

Appendix B

Trends in Eastern Pacific Nesting Populations of Leatherbacks

Table 1. Estimated abundance of nesting female leatherbacks in the Eastern Pacific. [ ] = number of nests

Year/Beach	80-81	83-84	86-87	87-88	88-89	89-90	90-91	91-92	92-93	93-94	94-95	95-96	96-97	97-98	98-99	99-00
Mexico																
Tierra Colorada	10,000[1]								1,000-2,000[1]		50-100[1]					[402][7]
Bahía Chacahua	2,000[1]								50-100[1]	50-100[1]						
Mexiquillo	3,000-5,000[1]		959[1]	240[1]						16[1]		[1,280][5]	[60][5]	[123][5]	[53][5]	[463[5]-469[7]]
Barra de la Cruz										299[1]						[296][7]
Other Mex. Beaches																[922][7]
Pacific Coast of Mexico												700-900[1] 1,093[3] [5,354][5]	236[3] [981[3] - 1,093[5]]	250-329[3] [1,596][5]	[1,117][5]	[4,317][5]
El Salvador																[20][7]
Guatamala																[109][7]
Nicaragua																[183][7]

Total (Mex. and Central America, w/o Costa Rica)																~1000[7]
Year/Beach	**80-81**	**83-84**	**86-87**	**87-88**	**88-89**	**89-90**	**90-91**	**91-92**	**92-93**	**93-94**	**94-95**	**95-96**	**96-97**	**97-98**	**98-99**	**99-00**
Costa Rica																
Playa Grande					1,367[4] - 1,646[2]	1,340[4] - 1,643[2]	665[4]-830[2]	770[4]-932[2]	909[4]-1,078[2]	180[4]-202[2]	469[2]-506[4]	421[4] 800-1000[1,6]	125[4]	195[4]	117[4]	
Playa Langosta							229[8]				239[2]	(800-1000)[1,6]				
Playa Naranjo		62[2]				93[2]	242[2]					30-240[1]				

[1]Summarized in Spotilla, *et al*. (1996), using an estimated clutch frequency of 5.

[2]Summarized in Steyermark, *et al*. (1996), using an estimated clutch frequency of 5.

[3]Summarized in Sarti *et al*. (1998), using annual average clutch frequency (observed and estimated).

[4]Summarized in Spotilla, *et al*. (2000).

[5]Sarti,L., personal communication, 2000.

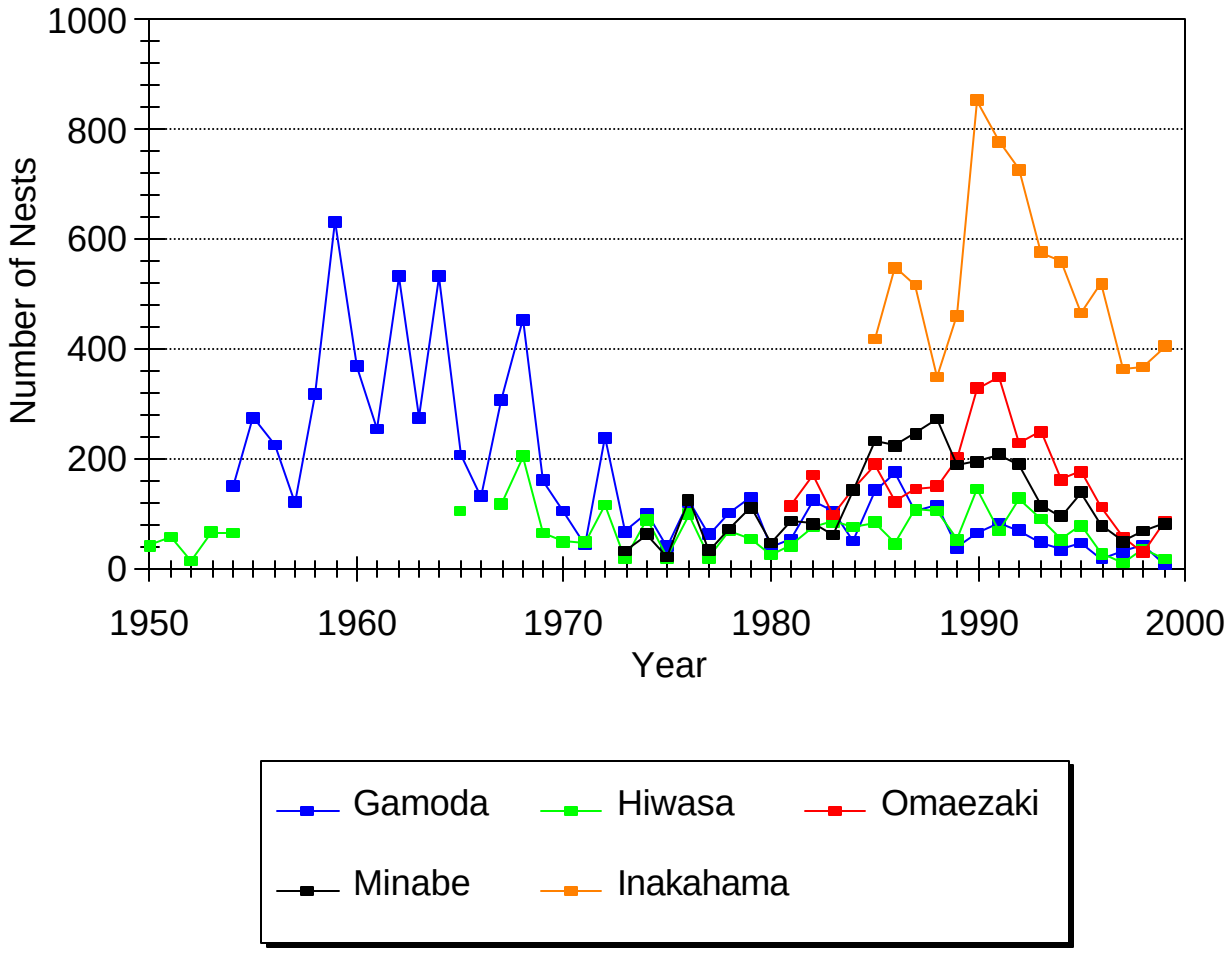
[6]800-1,000 estimated nesting females on both Playa Grande and Playa Langosta

[7]Preliminary results presented by L. Sarti, Leatherback Working Group Meeting, 23-24 May, 2000. Other beaches include Llano Grande, Playa Ventura, Agua Blanca.

[8]Chaves, *et al*., 1996.

Trends in Loggerhead Nesting in Japan

Table 2. Annual trends of nesting beaches in Japan



Source: Naoki Kamezaki